27

Tropical Products Institute

CFTRI, Experiment Station
Gole Bungalow, Chhindwara Road
Nagpur-1.

CLRI Lib. Bulk Jan
Unselected

G 54

The markets for certain herbaceous essential oils

CFTRI, Experiment Station
Gole Bungalow, Chhindwara Road
Nagpur-1.

Tropical Products Institute Report

CFTRI, Experiment Station
Gole Bungalow, Chhindwara Road
Nagpur-I.

G 54

The markets for certain herbaceous essential oils

A. D. Adamson

January 1971

Tropical Products Institute 56/62 Gray's Inn Road London WC1

This report was produced by the Tropical Products Institute, a British Government organization which helps developing countries to derive greater benefit from their renewable resources.

It specializes in post-harvest problems and will be pleased to answer requests for information and advice. Reports such as this one are often written as the result of an enquiry.

Reproduction of this report, in whole or in part, is gladly permitted provided that full acknowledgement is given to the Tropical Products Institute, and to the author or authors, where named.

Requests for further information should be addressed to:

The Director
Tropical Products Institute
56/62 Gray's Inn Road
London WC1X 8LU

ACKNOWLEDGEMENTS

The Institute acknowledges with gratitude the assistance given by users of essential oils and members of the trade in the preparation of this report.

Contents

CFTRI, Experiment Station
Gole Bungalow, Chhindwara Road
Nagpur-1.

	page
INTRODUCTION	1
CELERY	3
Introduction	3
Production	3
Uses	3
Celery seed oleoresin	4
Markets	4
United Kingdom	4
United States of America	5
Overall Market	6
Indian celery seed oil	6
Present situation	6
Prospects	7
PARSLEY	9
Introduction	9
Parsley herb oil	9
Parsley seed oil	9
Production	10
Uses	10
Prices	10
Markets	10
Prospects	10
FENNEL	11
Introduction	11
Bitter Fennel	11
Introduction	11
Uses	11
Prices	11
Markets	13
Prospects	13
Sweet Fennel	13
Introduction	13
Production	13
Uses	14
Prices	14
Markets	14
Prospects	14
MARJORAM	15
Introduction	15
Sweet Marjoram oil	15
Wild Marjoram oil	15
Production	15
Uses	15
Prices	16
Markets	16
Prospects	16

	page
ROSEMARY	17
Introduction	17
Production	17
Spain	17
Tunisia	17
Yugoslavia	18
Morocco	18
France	18
Italy	18
Uses	18
Prices	18
Markets	20
United States of America	20
United Kingdom	20
Japan	20
Prospects	20
THYME	
Introduction	23
Origanum oil	23
Production	23
Spain	24
Turkey	24
Uses	24
Prices	24
Markets	24
United States of America	24
United Kingdom	26
Other Markets	26
Prospects	26
REFERENCES	27
STATISTICAL APPENDIX	29

Introduction

This study investigates the markets for the essential oils obtained from the following six herbs: celery, parsley, fennel, marjoram, rosemary, and thyme. The first four oils are used mainly for flavouring, and the latter two in the perfumery industry. There are no significant common characteristics which have suggested the inclusion of only these essential oils in this report; this has been done mainly for convenience.

With the possible exceptions of celery and rosemary, these oils are among the less commercially important essential oils. Because of this, there is a dearth of available statistics on all these oils. No exporting country lists any of them separately in their trade statements; nor do the importing countries, with the exceptions of Japan and Morocco, in certain instances. It has therefore been extremely difficult to make quantitative statements in this study and, where estimates have been attempted, it should be understood that these are subject to a large margin of error.

Celery

Introduction

There are in fact two essential oils which can be distilled from the celery plant. The one which has a negligible commercial significance, and which will therefore receive no further attention in this report, is that distilled from the entire plant and called celery herb oil. This oil is less strong than the celery seed oil and, being less expensive, is occasionally used to 'stretch' the seed oil.

Celery seed oil is commercially significant, and is steam-distilled from the crushed seed of *Apium graveolens*, the familiar celery plant. This plant is widely cultivated in the temperate zones, where its bleached leaf stalks are a popular vegetable. Because of this large market for the celery stalks, celery seed finds an alternative outlet in the vegetable-seed trade. This trade demands high-quality fertile seed, and consequently it is common for the cheapest seed to be used in the distillation of the essential oil. The celery plant is particularly cultivated in several countries—France, India, Holland, Hungary, China, and the United States of America—but the seed which enters international trade for eventual distillation normally originates in India.

Production

Distillation of essential oil of celery seed takes place in all the above-mentioned countries, but the bulk of the world production is distilled from celery seed imported from India. The major distiller is almost certainly the United States of America, followed by France and the United Kingdom. In 1960, Arctander[1] estimated that the annual world production of celery seed oil had increased considerably and was within the range of 10-50 tons*. The extent of this range emphasizes the problems involved in attempting a quantitative estimate of production totals: those countries which produce seed and distil it locally, principally France, do not keep data on their production; while those countries which import celery seed do not import it solely for distillation purposes and so there is no simple method of deriving the quantities of oil distilled. Imported celery seed may also be used in the vegetable-seed trade (though it is probably safe to discount this when concerned with Indian celery seed). France, famous for her high-quality seed, tends to be the centre of this trade. Imported celery seed is also used in ground form as a dry seasoning, or for the extraction of an oleoresin. Further discussion on the relative proportions of celery seed imports destined for these different end-uses is in the section on markets.

Uses

Celery seed oil finds its major outlet in the flavour industry, where it is used in the flavouring of all kinds of prepared foods: soups, meats, sauces, pickles, and vegetable juices. But the bulk of demand for this oil almost certainly comes from the canned soup industry, where celery is an important flavour in its own right. The advantage of having such an individual market, rather than being used in spice blends, is that there can be no question of leaving the celery flavour out of the product if price difficulties should arise. So long as the product retains its popularity, and there is no

completely acceptable synthetic substitute, the producer is unlikely to discontinue this line.

The oil finds minor utilization in both the perfumery and the pharmaceutical industries. In perfumery, very small quantities are used extensively: it has a very powerful odour and, if used discriminatingly, imparts a pleasant warm note.

In pharmacy, it is still used in certain preparations where the oil supposedly exerts a sedative effect. Such use is extremely small and will probably become even smaller as specific synthetic chemicals and drugs replace such marginally effective natural materials.

Celery seed oleoresin

The market for the essential oil of celery seed cannot be properly discussed without reference to the oleoresin of celery used. The oleoresin is prepared by extraction of the seed, either with a hydrocarbon solvent or with ethyl alcohol. The solvent is subsequently evaporated, leaving the oleoresin as the residue. The advantage of the oleoresin over the essential oil is that the former contains more of the important high-boiling principles of the seed, some of which are hardly distillable with steam at all, and thus reproduces the aroma of the seed more completely than does the oil.

However, the oleoresin competes principally, not with the essential oil, but with the dry ground seed. This is so because the oleoresin is generally sold in the form of a dispersed spice extract: i.e., it is spread on a dry sterile base (usually salt, dextrose, flour or rusk) and is sold as, weight for weight, equivalent in strength to the ground seed. Its advantages over the ground seed are that it avoids the high bacterial load which most dry spices carry, and that it is standardized to a greater degree in strength and quality.

In the case of celery seed, the oleoresin dispersed on a base certainly competes with the essential oil, but opinions as to the strength of competition between the oil and the oleoresin vary. In 1960, Arctander suggested that the oleoresin was increasingly replacing the essential oil in a variety of flavour uses; yet a representative of a leading British firm was adamant that the two did not compete but had separate uses. This latter view is difficult to accept in its entirety, and it is likely that the two materials do compete, if not in the traditionally accepted uses of the oil, then certainly in the new opportunities arising from the expanding flavour business. In these new fields, the convenience of using a dry powdered flavour, together with the fact that the oleoresin more fully represents the odour and flavour of the seed, almost certainly results in a preference for the dispersed oleoresin over the essential oil. Yet, undoubtedly, the oil is preferred in certain uses and there is no reason why it should not share, in a minor way, in the generally expanding flavour business.

Markets

The size of the various markets for the essential oil of celery seed can only be determined by attempting a breakdown by end-use of the imports of celery seed into the principal markets.

United Kingdom

The United Kingdom annually imports an average of some 200 tons of celery seed from India. It has been estimated (by probably the largest spice grinder in the UK) that about 25 per cent of this tonnage is used in ground form, in celery salt and various spice/herb blends. Thus, taking this estimate of 25 per cent, and assuming

---

*Throughout this report the word 'tons' means metric tonne.

a rough import of 200 tons, 150 tons of celery seed are used for the distillation of an oil and the extraction of an oleoresin.

There is only one major UK extractor of celery seed oleoresin, but it is extremely difficult to make a quantitative estimate of the oleoresin production. Without explaining the rather tenuous information and calculations on which the estimate is based, oleoresin of celery production in the UK is possibly of the order of 10-20 tons. With an extraction rate of approximately 20 per cent, this would involve the use of some 50-100 tons of celery seed, leaving 50-100 tons of seed for the distillation of oil.

According to Guenther[2] the yield of essential oil from Indian celery seed varies from 2·1 per cent to 2·5 per cent. Taking the higher figure of 2·5 per cent, this suggests that the annual UK production of essential oil of celery seed is of the order of 1·25 to 2·5 tons, with a likely bias towards the larger estimate. This does not appear to be a large tonnage but, given the strength of this oil, it is not insignificant. There is also competition from a French essential oil of celery on the UK market. It is impossible to estimate the quantities of this French oil imported into the UK, but it is unlikely that they amount to more than a few hundred kilos per annum at most. Prices will be discussed later, but it should be mentioned here that the French oil of celery seed sells at a considerably lower price than the English distilled oil. This does not necessarily mean that the French distillers are more efficient or that their seed is very much cheaper.

Forward price quotations are still being listed for Chinese celery oil, none of which appears to have been marketed, at least in the UK, since the late 1950s. It is certainly the case that none is available at the present time (1970) and so Chinese celery oil can be safely dismissed from further consideration in this report.

United States of America

The United States imports, on average, around 1,350 tons of celery seed per annum. Since the beginning of the 1960s there has been no large change in this quantity, despite considerable fluctuation from year to year and perhaps a slightly rising trend. But, from the mid-1950s to the early 1960s there was a dramatic change, with average imports of celery seed rising by some 34 per cent, or just over one-third. Of this 1,350 tons, there is a regular import from France of some 75-95 tons per annum of more expensive seed, presumably for use as vegetable seed in the growing of celery.

The remainder, apart from small amounts in recent years from Indonesia, comes from India. A breakdown of the seed imports between the various uses is even more difficult in this market; the only estimates available are for the celery seed which is extracted to give an oleoresin. Oleoresin of celery appears to be an increasingly popular material in the USA, but estimates of its production vary from 25 tons per annum to perhaps 80-90 tons per annum—the higher estimate is more likely to be correct, thus involving the use of some 400-450 tons of celery seed. It is believed that the bulk of the celery oleoresin, dispersed on a base, is used in canned soups in the USA.

Thus, some 805-875 tons of celery seed per annum are used in the USA either as a ground herb or for the distillation of an essential oil. No estimate is available for the quantities of seed crushed and used as such but, prima facie, it is probably a smaller proportion than in the UK since the substitution of dispersed extracts for the ground herb in industrial use has gone further in the USA than in the UK. Taking a crude estimate of 20 per cent of celery seed imports used in ground form, i.e., about 270 tons per annum, there remain roughly 535-605 tons available for distillation, giving an annual essential oil production of approximately 11·8-13·3 tons. It should be emphasized that this estimate could well be in error by a considerable margin.

Overall market

Without considering any other individual markets, some tentative conclusion might now be reached concerning the overall market for celery seed oil. Given that substantial quantities of celery seed are exported from India to other countries such as Canada, France, and the German Federal Republic, and also that distillation takes place in the countries of origin of celery seed, especially France, it is likely that several more tons are distilled throughout the world. Adding the USA and the UK productions, plus a few tons for the other distilling countries (French production might well be higher than that of the UK), a very rough estimate of some 20 tons might be valid for world production. This comes well within Arctander's very wide range, noted earlier, and suggests that present production levels are closer to the lower end of his range. However, the very tentative nature of these estimates must again be emphasized.

Indian celery seed oil

India provides the great bulk of celery seed for the distillation of the essential oil, yet only a small amount of oil is distilled in India itself. There are several firms in India which distil an essential oil, and one or two which extract an oleoresin, but the demand for these materials from the large consuming countries, principally the USA and Western Europe, is not forthcoming. The argument put forward by interested parties in the UK and the USA is that Indian celery seed oil is not of sufficiently high or standard quality to meet the strict specifications of the food industry in these countries.

Indian celery seed oil could be marketed in the West at a considerably lower price than oil distilled in the consuming countries, because of the freight saving involved in not having to ship the whole seed across the world. But it would still be a relatively expensive oil and would therefore have to compete principally on quality grounds. It would be necessary for a prospective Indian supplier to convince an established essential oil interest in the consuming country that Indian supplies would be continuous and of the required quality. There has recently been a shortage and trade in celery seed oil has almost come to a complete halt; supplies of oil from India or anywhere else would therefore be extremely welcome. However, the price of the seed itself has risen greatly and, together with the fact that much of the harvest was sold forward, this has prevented Indian distillers from exploiting this opportunity to enter the Western markets.

Present situation

The price of English distilled celery seed oil has risen to remarkable heights (Fig. 1). From a price of 484 shillings per kilo in the third quarter of 1968, it rose to a high of 880 shillings per kilo in the third quarter of 1969. Prices continued to rise, reaching a peak of 2,455 shillings per kilo in January and February of 1970. But these latter price estimates are rather artificial—the fact is that in recent months there have been virtually no supplies of celery seed oil at all and, so, whenever a new batch of even a few kilos appeared on the market it naturally fetched a very much higher price than the previous one. The price of French oil did not reach these fantastic heights only because supplies of this oil ceased to be offered at an earlier date.

The present extreme shortage is due to a very poor crop of Indian celery seed in the present cropping year, 1969-70. The crop apparently amounts to only 1,500 tons as against an earlier estimate of 2,200 tons. This shortage would naturally raise the price of the celery seed considerably. But the situation was very much aggravated by the fact that a very high proportion of the crop was sold forward, mainly to the USA but also to the UK and European importers. When the crop arrived, shippers

had great difficulty in meeting these commitments and so the price paid to producers of celery seed was pushed up further. The situation has become so drastic that shippers in India are said to have been attempting to buy back promised supplies from importers in the consuming countries. These experiences resulted in the price of celery seed being bid up to very high levels.

Prospects

The important point is what effect this situation of high prices and extreme shortage is having and will continue to have on the demand for the essential oil of celery seed. Assuming a return to a reasonably good crop of celery seed in India in the 1970-71 season, the situation will be very much easier, although prices will probably remain above the pre-shortage norm since there is no carryover of seed from this season.

But demand must certainly have been reduced by the present situation. The very high prices of the oil over the last 18 months or so must have started many users thinking in terms of alternatives for the oil. More important than the high prices is the absolute lack of supplies which obviously must have cut down its use. Available supplies of oil have probably been stretched as far as possible. However, the shortage has been such that many users of celery seed oil must have been obliged to omit the celery flavour from a spice blend or cut production of products containing oil of celery seed. Once such steps have been taken, they have a tendency to be irreversible, at least in the short run: the food industry does not want to be caught again in such a situation. Thus, the future prospects for the oil depend very much on the decision of the users in the food industry, but these are subject to pressure from consumer preference. Whether celery is a popular enough flavour to regain its former position is a moot point. It is impossible to quantify the short-run effect of the present shortage on the demand for celery seed oil, but it can only be detrimental.

However, in the longer run, celery seed oil should regain much of the ground it has lost in the present state of shortage (the prospects for this season's crop are good) and its future will then depend on its competitive position with celery seed oleoresin. With the increased use of convenience foods, the demand for flavours will continue to rise at a fairly rapid rate. Accepting that the demand for the celery flavour expands as rapidly as the overall flavour demand, it is likely that the oleoresin will provide for the bulk of this increased demand.

Parsley

Introduction

Two oils of commercial interest are distilled from the parsley plant: oil of parsley herb and oil of parsley seed. The latter is the more commercially important of the two.

Parsley herb oil

The herb oil is distilled from the top of the flowering plant, *Petroselinum sativum,* a herb native to the Mediterranean countries but widely grown elsewhere. Since the parsley herb is extensively employed for garnishing and seasoning a wide variety of dishes, and assuming that an essential oil should be an odour and flavour replacement for the herb itself, oil of parsley herb is a far better reproduction than the seed oil. The herb oil is used almost entirely in flavour work, for the seasoning of many sauces and meat dishes.

Although parsley is cultivated all over Europe, and also in the USA, the herb oil is distilled mainly in France and Hungary. Because of the very small yield of essential oil from the flowering tops of the parsley plants (0·06 per cent, according to Guenther[2]), the price of the oil is extremely high: according to the appended price statistics, the price of parsley herb oil has remained at 110 shillings per ounce for the last five years.

The world production of the oil is very small indeed. Arctander estimated it to be less than 100 kilos; a large firm contacted in the preparation of this report confirmed this estimate. There is thus a small and probably stable demand for this expensive oil but, because of the price, it is very unlikely that this demand will increase to any significant extent.

Parsley seed oil

The seed oil is produced by distillation of the seed of *Petroselinum sativum.* Because of the great popularity of the parsley herb itself in the preparation of food dishes, the herb is cultivated on a large scale in several European countries—France, Poland, Holland, Germany, and Hungary. Distillation takes place mainly in France, but to a lesser degree in Holland, Germany, and Hungary. Distillation does not compete for parsley seed with the vegetable-seed trade, the latter being the larger commercial concern. The seed used for the distillation of the essential oil is what is known as 'superannuated' seed, i.e., seed which has lost its germinating power and is therefore useless for planting. This seed is sold, at approximately half the price of fertile seed, to the distillers. Therefore, there is in practice a maximum supply limit on parsley seed oil which is set by the quantities of 'superannuated' seed available each year. Since there has been no pressure on the price of parsley seed oil in recent years, it would seem that demand has not been large enough to press against this supply barrier.

Production

It is extremely difficult to make a quantitative estimate of the annual production totals of parsley seed oil. France is probably the largest producer (nothing is known of the Hungarian production) and certainly the largest exporter of the oil, but no figures are recorded. The UK is also a major producer of parsley seed oil, meeting the bulk of her own market requirements. One of the large essential oil houses in the UK grows its own parsley and distills its own oil requirements, which amount to no more than one ton annually but are normally sufficient to meet the bulk of the UK demand.

A very rough estimate of annual world production would be of the order of 5 tons, but it may be as low as 2-3 tons.

Uses

Parsley seed oil finds major use in the flavour industry, where it is normally blended with other spice or herb oils before being added to a variety of sauces and food preparations. It does not find much use as an individual flavour, principally because its taste is rather bitter and so, if the unique flavour of parsley is to be appreciated, it must be blended with other materials before use.

The oil is also used in perfumery, to import a spicy note to certain creations, particularly in the field of men's toiletries. But its total use in perfumery can amount to no more than a few kilos per annum.

Prices

The appended statistics record prices of parsley seed oil separately only since the beginning of 1966. Before this time, prices are given for a 'parsley oil' and it is very likely that this was, in fact, oil of parsley seed. The price of parsley seed oil has been very stable indeed, apart from a six-month period at the beginning of 1966 when the price rose from 198 shillings per kilo to 308 shillings per kilo (assuming the 'parsley oil' quoted was in fact the same oil as that subsequently quoted as parsley seed oil). The price of the seed oil has remained at 308 shillings per kilo from the third quarter of 1966 to the present time.

Markets

The largest market for parsley seed oil is almost certainly in the USA. One of the large essential oil houses in the USA annually imports about 225 kilos from France, suggesting that the annual import of the oil into the USA is of the order of 1-2 tons. The second largest market is probably the UK which, as already noted, produces the bulk of supplies to meet home demand. Depending on the crop of parsley at home, which in turn depends on the weather, the UK normally imports 5-25 per cent of domestic oil requirements, this residual quantity being supplied by France.

The market in Western Europe for parsley seed oil is almost certainly smaller than in either of the preceding two countries, because the trend towards pre-flavoured convenience foods, although under way, has not progressed as far as in the USA and the UK.

Prospects

The demand for parsley seed oil has remained stable over recent years and there is no reason why it should not continue to do so. But it is unlikely that demand will expand significantly in the future: a parsley oleoresin is extracted in the UK and probably also in the USA. As with celery oleoresin, the oleoresin of parsley has certain advantages over the essential oil. Although the production of this oleoresin is very small at present, it is probable that the oleoresin will take the greater share of the expanding demand for the parsley flavour in the food industry—assuming that the demand for the parsley flavour does expand in line with the demand for flavours in general.

Fennel

Introduction

There are two main forms of fennel herb, bitter fennel (*Foeniculum vulgare* var. vulgare) and sweet fennel (*F. vulgare* var. dulce). The fruits (or seeds) of both forms, besides being used in ground form as a seasoning, are sources of essential oils which are used in both flavouring and perfumery work.

Bitter fennel

Introduction

There are two types of bitter fennel, wild-growing fennel and cultivated fennel; each is used for the production of a different essential oil.

a. Bitter fennel grows wild in the regions bordering the Mediterranean, and an essential oil is distilled from the upper parts of these wild plants just before the seeds begin to ripen. Distillation takes place mainly in Morocco. Arctander in 1960 stated that the total annual production could not be much more than 10 tons. The oil has a strong smell and is used largely in the perfuming of industrial products such as aerosol sprays where it serves to mask unpleasant odours. This oil is not the bitter oil of commerce, according to Arctander[1], and no further details are available concerning the trade in this oil.

b. Bitter fennel is cultivated in most countries of temperate Europe, North and South America, and in Western Asia. It is the oil from this seed which is the bitter fennel oil of commerce. Distillation takes place in most of the countries of the European Economic Community, particularly Germany, and in Hungary and India. Arctander in 1960 estimated annual world production to be within the range of 25-75 tons, but declining.

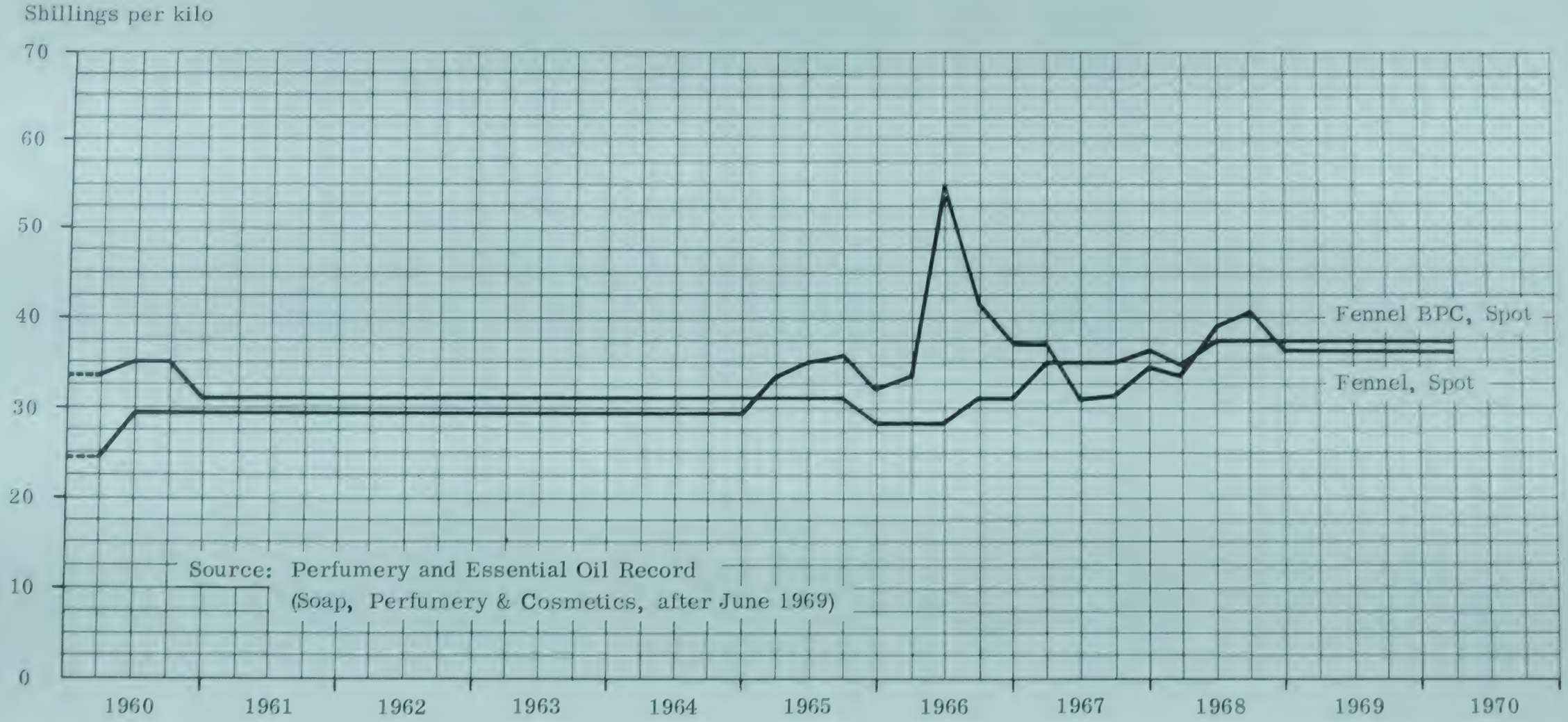
Uses

The oil is most extensively used in Germany and other central European countries, where the bitter fennel herb has been very popular for centuries. It is used in the flavouring of foods and liqueurs. Bitter fennel seed oil also finds frequent use at the lower end of the perfumery industry where it is used as a masking agent in the preparation of industrial perfumes for incorporation into sprays, insecticides and similar products.

Prices

Referring to the graph on the opposite page (Fig. 2), the prices listed as 'Fennel, Spot' are those for the bitter fennel seed oil of commerce. In the first half of the 1960s, the price was stable at 29·7 shillings per kilo. There then followed a period of fluctuations, all of which were minor apart from mid-1966 when the price of this oil

FIGURE 2. Fennel Seed Oil. Quarterly Average Prices, London Market



rose suddenly from 33·4 shillings per kilo to 55·0 shillings per kilo; it fell back to 41·6 shillings per kilo in the next quarter. Since the fourth quarter of 1968, the price has remained constant at 36·3 shillings per kilo. Thus, the price of the oil has not changed markedly over the decade of the 1960s, eventually settling at a slightly higher level than that predominating at the beginning of the decade.

Markets

Very little information is available on the markets for bitter fennel seed oil. It is believed that the German Federal Republic is the main producer and exporter of this oil, exporting considerable amounts to neighbouring countries. It has also been suggested that the USA is a reasonably large buyer. Certainly, before World War II (when imports of fennel oil were recorded), the USA imported large quantities of fennel oil, but it is very difficult to estimate how much of this was of the bitter variety.

The UK market for bitter fennel seed oil is very small indeed. Contact with members of the essential oil trade in the UK suggests that the UK imports no more than perhaps a half ton annually, possibly even less.

Japan is the only country which publishes figures for the imports of fennel seed oil, though not differentiating between the different types. From an average import of 231 kilos in the years 1960-65, imports rose sharply to almost 3 tons in 1966, rose further in 1967 to 3·9 tons and in 1968 to 4·6 tons, before dropping off to 2·5 tons in 1969. Thus the Japanese market, though small absolutely, could be a promising one. The bulk of her needs were supplied by the German Federal Republic, with the Netherlands providing the remainder. This strongly suggests that imports were of the bitter fennel oil variety.

Prospects

Since very little is known of either the production or the markets for bitter fennel seed oil, it is obviously difficult to comment on the prospects for this oil. However, it is apparently frequently adulterated with a variety of natural and synthetic materials, producing oils which often appear to be as acceptable as the genuine oil. Nevertheless, provided the price of the oil remains at its present relatively low and stable level, there is no reason why it should not continue to have much the same demand as at present.

Sweet fennel

Introduction

Sweet fennel oil is distilled from the seed of sweet fennel (also known as Roman Fennel). This plant does not grow wild but is cultivated, according to Arctander, in France,.Italy, and Greece. Evidence suggests that it is also cultivated in Spain since, according to members of the British trade, UK supplies of sweet fennel oil originate in Spain.

Production

France, Italy, and Spain are the main producers of the essential oil of sweet fennel. The annual production in France was at one time around 500 tons but, since then, production has fallen greatly and it is very likely that the present production of sweet fennel oil is considerably less than the production of bitter fennel oil. Spain is probably now the largest exporter of this oil.

Uses

Sweet fennel oil finds its major use in flavour work, particularly in liqueurs and candies where its peculiar aniseed-like flavour was at one time very popular indeed. It also has a limited use in the compounding of certain perfume types.

Prices

The 'Fennel Oil BPC' (*British Pharmaceutical Codex*) is the sweet fennel oil of commerce, according to Arctander. It has been suggested that this is not the case and that the Fennel Oil BPC listed in the price appendix is merely a bitter fennel oil which conforms to BPC standards. This latter view seems unlikely since, if it were so, then in mid-1966 the price of the ordinary oil of bitter fennel was 26·4 shillings per kilo higher than the price of the BPC grade. This seems inherently implausible and so it is assumed that the BPC grade is indeed the oil of sweet fennel. The price, which in the late 1950s was approximately twice that of the bitter fennel oil, has fallen since then and has stabilized at a slightly higher level than that of the bitter fennel oil. As can be seen from the graph, some minor fluctuations occurred in the mid-1960s, but since the second quarter of 1968 the price has remained at 37·4 shillings per kilo.

Markets

There is even less information available on the markets for sweet fennel oil than there is for bitter fennel oil. It is unlikely that sweet fennel oil is traded in large quantities. The UK provides a market for perhaps 2 tons of sweet fennel oil per annum. From the Japanese figures it seems unlikely that any of her present imports are of sweet fennel oil. The largest market for this oil seems to have been in France and, to a lesser extent, in other Western European countries. Although the markets in these countries are now much smaller, they probably remain the largest.

Prospects

The prospects for sweet fennel oil are rather unpromising as synthetic trans-anethole of high quality is now available. Thus, where synthetic trans-anethole is produced and readily available, the markets for sweet fennel oil have been severely affected. The demand may eventually stabilize at a low level of a few tons, since the oil is still desired for certain specific uses, and cannot apparently be substituted for by synthetic trans-anethole in those uses.

Marjoram

Introduction

There are two commercially available essential oils of marjoram: oil of sweet marjoram, which has little commercial significance, and oil of wild marjoram, which is the major oil of commerce.

Sweet marjoram oil

Oil of sweet marjoram is distilled from the leaves and flowering tops of *Origanum majorana,* a plant which is cultivated in many parts of Europe, in North Africa, and also in the USA. The normal purpose of cultivation of this plant is for use as a culinary herb, marjoram herb being a very common kitchen seasoning in many parts of the world.

An oil is distilled from the plant in many European countries, but French and Tunisian oils, particularly the former, are probably the most significant and also the best. Sweet marjoram oil is fairly expensive and finds limited use in flavour work; traces of this oil are also used in certain perfumery compounds. The production of sweet marjoram oil is very small, perhaps of the order of less than 1 ton annually, and easily accommodates itself to the small demand.

Wild marjoram oil

Oil of wild marjoram is distilled from the flowering herb, *Thymus masticina,* which grows wild in the provinces of Huelva, Seville, and Granada in Spain. The herb is collected and distilled by the local peasants.

Production

In 1960, Arctander estimated that the production of wild marjoram oil varied between 5 and 20 tons per annum. More recent evidence suggests that present annual production is approximately 4 tons, whereas formerly it varied between 12 and 15 tons per annum. The fall in production was apparently not due to difficulties on the supply side, but rather to a fall in demand for the oil. The available evidence suggests that production could quite easily be increased to meet a rising demand, if such were to occur.

Uses

Oil of wild marjoram, which has a thyme/laurel-like aroma, finds extensive but quantitatively small use in flavour work, being used in meat sauces and in mixed spice blends for canned soups, etc. It probably finds small application in perfumery, but Arctander, for one, believes that this particular oil has little to offer in this respect.

Prices

Because of its commercial insignificance, there are no available recorded price statistics on this oil. The present price of the oil is around 41 shillings per kilo cif, on both the London and the New York markets. It seems likely that this price has been fairly stable, certainly over the last few years, although it is quite probable that it is following a gradually rising trend, due to increased costs of production at source.

Markets

There are absolutely no figures available on any of the markets for wild marjoram oil but, from impressionistic evidence, the main markets are the USA and the UK. One large American essential oil firm regularly imports around 500 kilos per annum, while trade contacts in the UK indicate that they deal in lots of 50 kilos or so at a time. Thus, it can probably be deduced that the USA is the largest market, followed by the UK, with small amounts probably used on the Continent and perhaps in Japan.

Prospects

The future for oil of wild marjoram is not particularly bright. Demand has fallen off over the years but appears to be fairly steady at the present time. It is unlikely that there will be any significant rise in demand; the existence of an oleoresin of marjoram probably precludes any large rise in demand for the oil, even assuming a future increase in demand for the flavour of marjoram in the food industry.

Rosemary

Introduction

The essential oil of rosemary is steam-distilled from the flowers, leaves, and twigs of *Rosmarinus officinalis,* a plant which grows wild in large quantities, mainly in countries bordering the Mediterranean. Rosemary is not generally cultivated, although at one time it may have been cultivated in small lots in France for the distillation of an essential oil of particularly high quality.

Production

Distillation of the essential oil takes place mainly in Spain and Tunisia, with smaller quantities distilled in Yugoslavia, France, Morocco, and Italy. Certainly in Spain and Tunisia, collection and distillation is very much an enterprise of the local people, many of whom operate their own simple stills and then sell their oil to larger traders who subsequently export it. Annual world production of rosemary oil has been increasing gradually over the years and is probably now of the order of 250-300 tons.

Spain

Spain has traditionally been the largest supplier of rosemary oil, but appears to be rapidly losing pre-eminence to Tunisia in this respect. Where Spanish production of rosemary oil was at one time around 150 tons, it fell to an estimated 100 tons or so by 1964 and has since fallen further to a present annual production of around 80 tons. (This latter estimate was provided by a member of the essential oil trade.) The reason for this fall in production stems from the nature of the collection process. Traditionally a part-time occupation performed by Spanish farmers, the collection of the herb and the distillation of the oil have fallen away because of general development in Spain, particularly the tourist boom which has provided alternative occupations for many small farmers. The rewards from such occupations are far greater than those to be gained from distilling rosemary oil. Perhaps, if the Spanish had had a monopoly and could have raised the price of their oil to cover these increased costs of production, then supplies could have been maintained. Tunisia, however, was always ready and willing to increase her supplies without raising the price. The quantities of rosemary oil produced in Spain will probably continue to decrease, albeit gradually, as the tourist boom continues to promote material development.

Tunisia

The production of the essential oil of rosemary in Tunisia is increasing continually. In 1960, Arctander[1] estimated that Tunisia produced some 35 tons annually; according to the official essential oil organizing body in Tunisia, they produced and exported 170 tons in 1969. This is a very large increase and, although part of it replaced Spanish production, it is clear that much of it was supplied to meet an overall increasing demand. The reason why the Tunisians can afford to increase their

production is simply that Tunisia is a less developed country than Spain, has experienced no tourist boom, and so her farmers are still quite content to reap the less rewarding benefits obtained from the collection of rosemary and the distillation of the oil.

Yugoslavia

Production of rosemary oil in Yugoslavia fluctuates a great deal, but probably averages around 18 tons per annum. The oil is of very high quality and is therefore limited to a relatively small market, mostly at the finer end of the perfumery scale.

Morocco

Very little information is available on the production of rosemary oil in Morocco. The industry seems to have been in existence for many years but, for some reason, has never developed. However, it is possible that Morocco's production is somewhat larger than it appears to be and that its oil is supplied by way of some of the larger producers, who claim it as their own.

France

French production of rosemary oil is probably only a few tons, principally because labour costs are very much higher. French rosemary oils are of excellent quality but are usually too expensive for normal use and are therefore used only in selective work, usually in high-class perfumery. These comments refer to true French rosemary oil. There is a far larger tonnage of 'French' rosemary oils which are exported from France but these are probably only the better Spanish and Tunisian oils which have been re-routed through France.

Italy

There is a very small production of rosemary oil in Italy. Again, the oil is of very high quality but prices itself out of the general market and is demanded only for certain specific uses at the finer end of the perfumery scale.

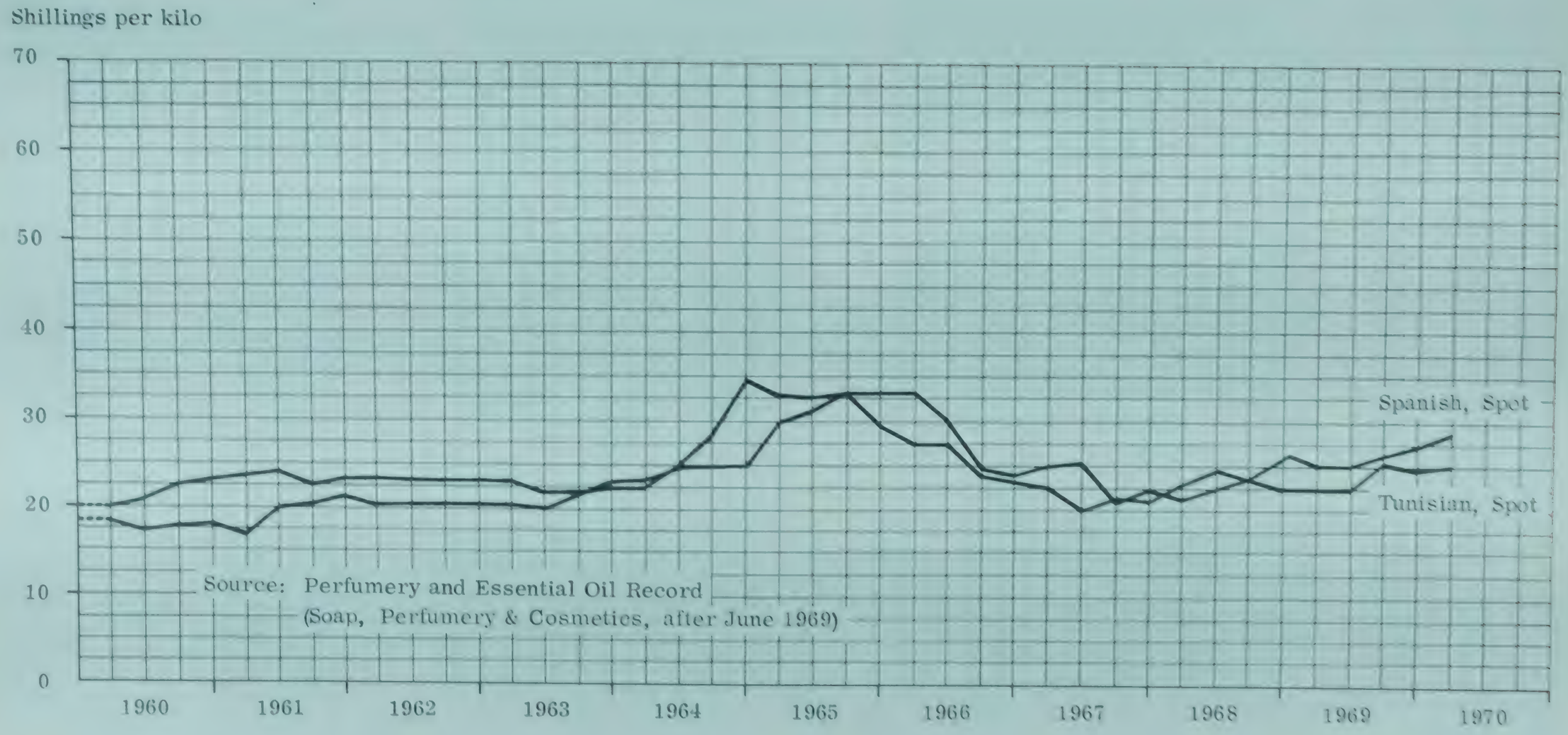
Uses

Rosemary oil is used almost wholly in the perfumery industry, and the great bulk of world supplies are used at the lower end of the perfumery scale, in the production of soaps, detergents, household sprays, and other such products. It is an excellent fixative material and also contributes a strong fresh odour, which blends well with various other oil odours and also serves to mask the unpleasant smells of certain other ingredients.

Prices

As indicated in the graph opposite (Fig. 3), the price of rosemary oil has been fairly stable over the decade of the 1960s, with the exception of a significant fluctuation between 1964 and 1966. Overall, there has been a slight upward trend. The prices of the oils from the two major suppliers, Spain and Tunisia, tend to run parallel, as might be expected. At the beginning of 1960, the price per kilo of Spanish rosemary oil was 18·3 shillings while that of Tunisian rosemary oil was slightly more expensive at 20·2 shillings. The differential reached 4·4 shillings per kilo in the second quarter of 1961, lessened in subsequent years until, in the last quarter of 1964, the position reversed itself and Spanish oil was selling at a price of 9·9 shillings per kilo more than the Tunisian. This differential quickly closed and the price leader alternated, but with

FIGURE 3. Rosemary Oil. Quarterly Average Prices, London Market



the Spanish generally slightly more expensive. In the first quarter of 1970, Spanish oil was selling for 3·3 shillings per kilo more than Tunisian oil. Apparently the Spanish have made several attempts in recent years to raise the price of their rosemary oil, but the competition from Tunisia has continued to prevent them from being able to do this.

Markets

United States of America

The USA is certainly the largest market for rosemary oil. Separate statistics of the USA imports of rosemary oil are no longer recorded in the trade returns, but such statistics were kept until 1964 and so should give a good indication of the size of the USA market. In the years 1960-64, imports of rosemary oil varied around an approximate average of 80 tons, with no discernible trend. The great bulk of imports in the years 1960-63 was from Spain, with France providing significant quantities, averaging 9-10 tons but falling to less than 4 tons in 1963. There is no way of knowing but it is likely, as has already been suggested, that some of the supplies from France are in fact of Spanish origin. In 1964, imports reached a peak of 103·4 tons—Spain's contribution fell while France's share advanced sharply to 26·0 tons, and imports were recorded from Japan and Brazil of 19·2 and 7·8 tons respectively. Again, it can only be presumed that the rise in exports from France, and the Japanese and Brazilian supplies, came originally from either Spain or Tunisia. Tunisian exports to the USA reached a peak of 5·3 tons in 1964. No later figures are available but there is no reason to assume that the USA demand has not remained stable; the only significant change might be that the Tunisian oil has appropriated a larger share of the market.

United Kingdom

The United Kingdom does not list separately her imports of rosemary oil but, from aggregating the quantities used by individual firms, it seems probable that the UK demand for rosemary oil is approximately 60 tons or so per annum. Spanish oil has traditionally been given preference by the UK users but it is likely that the Tunisian rosemary oil is now being imported in larger quantities. More than 80 per cent of the rosemary oil imports are used by three large soap and detergent manufacturers in the United Kingdom. The demand by each of these concerns is fairly stable and they all considered it likely that it would remain so, provided the price did not rise too high or the quality deteriorate. In fact, suggestions were made that the quality of the oil supplies was rather poor in some cases and that this might be due to adulteration, but no confirming evidence was available. This point of quality was stressed, one large user stating that his firm would not stop using rosemary oil because of price increases but solely because of quality deterioration.

Japan

Japan is the only country which at present lists her imports of rosemary oil separately. These imports are not particularly large but do appear to be following a rising trend, having reached a height of 8·8 tons in 1969. Japan imports most of her oil from France, again presumably indirectly from Spain or Tunisia, with about one ton each from Spain and the UK.

Prospects

The future for the essential oil of rosemary appears to be fairly secure. It is an oil which to a certain extent depends on its relatively low price for a market. There can be no question of cultivating the rosemary plant for the distillation of an essential oil: such an oil would price itself out of any significant market. With increased costs of collection already becoming a problem in Spain, and presumably also a potential

problem in Tunisia, the price of rosemary oil will probably rise; but, provided that there are no very large and sharp rises, this trend should not upset the market in any way.

The quality of the rosemary oil is considered important, even though it finds its major use at the lower end of the perfumery scale. It is therefore essential to continue to provide supplies of rosemary oil of a good and standard quality. If these conditions are met, population increase should ensure a gradually rising demand for those products incorporating the oil and hence for rosemary oil itself in the forseeable future.

Considering the supply situation, Tunisia has taken over from Spain as the principal supplier of rosemary oil and this trend will probably continue. The large UK users, and probably the large users in the USA also, have no preference for one oil rather than the other and so are quite prepared to alternate between the two on price grounds alone. Apart from the added value which is apparently gained by routing Spanish and/or Tunisian oils through France, it has also been suggested that considerable quantities of Tunisian rosemary oil are supplied by way of Spain. There seems little to be gained from this practice since the large users think fairly highly of the quality of the Tunisian oil.

Supplies of rosemary oil seem quite adequate to meet demand at the present time and there is no apparent reason why Tunisia should not be able to increase production if necessary. An alternative supplier would have to compete with the Tunisian oil—this would be difficult, since supplies from Tunisia are of good quality and are sold at a reasonable price.

Thyme

Introduction

There are two forms of thyme oil which are commercially recognized: red thyme oil and white thyme oil. The former is a natural distillate while the latter is supposed to be a redistilled red thyme oil, but very often it is an amalgam of a variety of oils, only one of which is in fact red thyme oil.

Red thyme oil is distilled from the herbs *Thymus vulgaris, T. zygis,* and related species. The plant grows wild in almost all the countries bordering the Mediterranean, and also over much of Asia and parts of central Europe. The thyme herb is never cultivated for the distillation of an essential oil, although it may be cultivated for use as a culinary herb.

Origanum oil

Although this essential oil is not in fact listed as one to be included in this report, mention must be made of it here in an attempt to avoid the confusion which is common in the trade. The problem, according to Arctander, is that Spanish thyme oils are quite frequently origanum oils and vice versa, and a mixture of the two oils has even been offered under either name.

Origanum oil is distilled from *T. capitatus.* The essential oils of thyme and origanum are very similar, both of them containing phenols; the difference is that the phenol in thyme oil consists almost exclusively of thymol, while that of origanum consists almost wholly of carvacrol. There is no real justification for the confusion since these oils come from separate regions in Spain: thyme oil comes from the province of Almeria, while origanum oil comes from the Seville area. They are frequently confused, however, so account must be taken of this fact when consideration is given to the markets for thyme oil– a part of any market might be supplied by origanum oil. The Spanish production of origanum oil is estimated at the present time to be no more than 8 tons per annum.

Production (of thyme oil)

According to Arctander in 1960, the main distillers were Spain and Israel, with the former being the primary supplier to the world trade. The latter statement is undoubtedly true but there appears to be some doubt concerning the production of thyme oil in Israel. Official Israeli sources contacted in the preparation of this report stated definitely that Israel did not produce thyme oil, but in fact imported a little. The confusion possibly arises from the lack of distinction between thyme and origanum oils. It may be that Israel produces origanum oil and this has been called thyme oil at some time or other. Whatever the reason, it must be accepted that Israel does not at the present time produce any thyme oil.

Thús, Spain is the dominant supplier of thyme oil to the world market, and Turkey the only other significant supplier. Arctander estimated the world production of red

thyme oil to be within the range of 40-100 tons in 1960. Even at that time, the true figure was probably very close to the lower end of this range. Annual world production has probably now fallen away to around 17 tons or so.

Spain

Two reliable estimates of the annual Spanish production were made in the preparation of this report. An American source estimated that production was within the range of 10-15 tons per annum, while a Spanish source gave an estimate of about 12 tons per annum. In the past, some 25 tons were distilled in Spain per annum but this has fallen away, principally because of supply difficulties rather than any fall in demand. Again, the reason for the fall in production is the tourist boom which has offered far more lucrative and less arduous occupations in the cities. There has been much emigration from the province of Almeria, where the thyme oil originates, and it is therefore unlikely that annual production could again rise above some 15 tons.

Turkey

According to a British source, there has been a small production of red thyme oil in Turkey in recent years, amounting to perhaps 5 tons per annum. Much of this production was used internally but some entered world trade. Despite a lower phenol content, this oil was apparently making some progress in the UK trade in recent years. Unfortunately, no further relevant information is available.

Uses

Thyme oil probably finds its major use, certainly in the UK, in the perfumery industry, at the medium to lower end of the perfumery scale, in soap and detergent work. Again, like rosemary oil, it has a powerful fresh odour which can mask other unpleasant smells as well; providing a suggestion of a medicinal odour. Thyme oil is also used in flavour work, as an ingredient in various sauce blends and as a flavouring for some canned meats. In pharmacy, its germicidal properties result in thyme oil being used in mouth washes and many other types of disinfectant. In combination with other oils, it is found in some cough sweets or cough medicines. But, quantitatively, such uses are rather small.

Prices

The appended price statistics for red thyme oil (with a thymol content of 45-55 per cent) and the graph opposite (Fig. 4) reveal that the price of this oil has had a somewhat chequered career. From a level of 29·5 shillings per kilo at the beginning of the 1960s, the price has undergone several sharp fluctuations, the largest in 1962 when, in one quarter, the price rose from 26·4 shillings per kilo to 61·6 shillings per kilo. But, in the last few years, the price has tended to become steadier and has now levelled off at 69·3 shillings per kilo. Thus, ignoring the fluctuations, there has been a definite rising trend which has resulted in the price of thyme oil being more than twice as high at the end of the decade as at the beginning. This rising price trend is the result of the tourist boom in Spain, the effects of which have already been referred to.

Markets

The USA and the UK dominate the demand for thyme oil, with relatively small amounts being exported to several other countries.

United States of America

Separate statistics for the imports of thyme oil into the USA are no longer recorded, but they were until 1964 and so should serve to give some indication of the extent

FIGURE 4. Thyme Oil. Quarterly Average Prices, London Market

of the market. Imports in the years 1960-64 fluctuated considerably, the largest being 11·2 tons in 1961 and the smallest being 4·4 tons in 1962. The average import over these 5 years was 8·0 tons, and there was no discernible trend. A figure for the USA import of thyme oil in 1966 was provided by a private American firm: imports were recorded at 7·7 tons. It would thus seem reasonable to assume that the USA demand for thyme oil has remained fairly stable since those years, varying around a norm of some 8 tons. Contact with a very large purchaser of thyme oil in the USA, who regularly buys several tons annually, gave no indication that the market had eased in any way.

Spain supplies almost all of the USA's thyme oil requirements, with France providing in the years 1960-64, a residual quantity varying between 187 and 471 kilos annually. Again, it is unlikely that the oil supplied by France was in fact distilled in France: it was probably select Spanish oil re-routed through France.

United Kingdom

The UK does not record imports of thyme oil separately and so her markets must be estimated by aggregating the demands of individual purchasers. It would seem that the UK imports some 4-10 tons of thyme oil annually, almost all of which is used in the soap and detergent industry. Obviously, if the upper estimate is correct, the problem arises that USA and UK imports combined total more than the annual world production. The solution probably lies in the confusion between red thyme oil and origanum oil. It is very probable that some of the imports of both the USA and the UK are in fact of origanum oil (otherwise the estimated production totals are incorrect).

Other markets

From the size of the UK and the USA markets, it is evident that very little thyme oil is exported to the other countries of the world. However, Japan appears to be a rather significant and increasing market. Japan is one of only two countries which record separately their imports of thyme oil. Japan's imports of thyme oil have been following a definite upward trend, from a minimum of 262 kilos in 1960 to a maximum of 1,170 kilos in 1968.

Morocco, the only other country which lists her imports separately, imported only a few kilos until the years 1965 and 1966 when imports amounted to 3,081 and 2,675 kilos respectively. In the following two years, imports fell back to 192 and 176 kilos respectively. Supplies come from France and therefore, presumably, indirectly from Spain. It is quite possible that Morocco re-exported the large imports of the two years, 1965 and 1966.

Prospects

The trade in the essential oil of thyme has certainly fallen off somewhat from what it has been in the past. Yet large users report that their demands are firm and see no reason why they should not remain so in future years. However, to an extent, like rosemary oil, thyme oil depends on its relatively low price for finding an extensive market. Its price is definitely on a rising trend which is likely to continue as costs of production in Spain rise. This rise in price will continue to reduce the demand for red thyme oil, albeit very gradually.

The prospects for an alternative supplier in this field would appear to be fairly good provided supplies of fair quality oil at a price which undercuts the Spanish price could be made available. Turkish production might well develop to take a larger share of the market. The market itself is not very large, but it is possible that the availability of supplies at a price considerably lower than at present could not only result in the supplying country taking over the existing market but also creating an expanded market for itself.

References

[1] Steffen Arctander, 'Perfume and Flavor Materials of Natural Origin', published by the author, 1960.

[2] Ernest Guenther, 'The Essential Oils', published by D. Van Nostrand Co. Inc., 1952; reprinted January, 1967.

Table 1
Fennel oil
Imports into Japan

		1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Totals	kg	375	195	103	172	270	270	2,935	3,900	4,600	2,500
	£'000	1·7	2·0	0·2	0·7	0·4	1·0	4·7	6·4	7·7	4·5
of which from:											
France	kg	83	–	–	–	–	170	20	–	–	–
	£'000	1·1	–	–	–	–	0·9	–	–	–	–
German Fed. Rep.	kg	245	45	40	60	250	100	2,855	2,700	3,500	2,000
	£'000	0·4	0·1	–	0·1	0·4	0·1	4·6	3·6	5·4	3·2
Italy	kg	–	–	–	84	–	–	–	–	–	–
	£'000	–	–	–	0·6	–	–	–	–	–	–
Netherlands	kg	35	40	60	11	–	–	60	1,200	1,100	500
	£'000	0·1	0·3	0·1	–	–	–	0·1	2·8	2·3	1·3
Spain	kg	2	–	–	–	–	–	–	–	–	–
	£'000	–	–	–	–	–	–	–	–	–	–
United Kingdom	kg	10	110	–	–	–	–	–	–	–	–
	£'000	0·1	1·6	–	–	–	–	–	–	–	–
United States	kg	–	–	3	17	20	–	–	–	–	–
	£'000	–	–	0·1	–	–	–	–	–	–	–

Source: *Trade of Japan,* Japan Tariff Association.

Table 2
Rosemary oil (a)
Imports into United States

		1960	1961	1962	1963	1964
Totals	kg	82,902	80,235	78,297	66,180	103,373
	£'000	56·4	66·4	68·4	65·1	118·6
of which from:						
France	kg	8,020	10,981	9,184	3,752	25,982
	£'000	5·9	9·7	9·6	10·3	27·2
Italy	kg	–	12	–	–	1,200
	£'000	–	1·1	–	–	1·3
Spain	kg	72,733	68,112	67,133	61,348	43,842
	£'000	48·1	54·6	57·0	53·9	44·8
Japan	kg	–	–	–	–	19,204
	£'000	–	–	–	–	25·1
Tunisia	kg	349	1,130	1,980	1,080	5,299
	£'000	0·3	1·0	1·8	0·9	4·9
Brazil	kg	–	–	–	–	7,846
	£'000	–	–	–	–	15·3
Peru	kg	1,800	–	–	–	–
	£'000	2·1	–	–	–	–

(a) Information not shown separately after 1964.
Source: *Bureau of the Census Report FT110,* Department of Commerce.

Table 3
Rosemary oil
Imports into Japan

		1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Totals	kg	4,474	3,590	2,744	3,462	4,283	5,479	8,000	6,820	7,343	8,829
	£'000	4·4	4·1	3·4	4·2	5·2	8·9	11·9	8·6	10·2	13·3
of which from:											
France	kg	3,947	3,004	2,306	2,277	3,300	4,010	4,360	5,170	5,463	6,455
	£'000	4·0	3·2	2·9	3·0	3·9	6·3	6·7	6·7	7·9	10·3
German Fed. Rep.	kg	13	20	—	—	—	50	—	—	—	—
	£'000	—	—	—	—	—	0·1	—	—	—	—
Italy	kg	—	340	—	—	—	—	1,000	—	—	—
	£'000	—	0·7	—	—	—	—	1·5	—	—	—
Netherlands	kg	—	1	—	—	—	—	—	10	—	14
	£'000	—	—	—	—	—	—	—	0·1	—	0·2
Spain	kg	51	—	—	100	—	300	1,490	1,000	1,340	1,280
	£'000	—	—	—	0·1	—	0·4	2·1	1·1	1·7	1·5
United Kingdom	kg	100	225	75	722	620	530	1,150	640	540	1,080
	£'000	0·1	0·2	0·1	0·7	0·8	1·0	1·6	0·7	0·6	1·3
United States	kg	363	—	363	363	363	589	—	—	—	—
	£'000	0·3	—	0·4	0·4	0·5	1·1	—	—	—	—

Source: *Trade of Japan,* Japan Tariff Association.

Table 4
Thyme oil (a)
Imports into United States

		1960	1961	1962	1963	1964
Totals	kg	9,756	11,239	4,387	9,817	4,671
	£'000	15·4	25·3	7·9	17·2	9·3
of which from:						
France	kg	471	185	272	266	447
	£'000	0·7	0·3	0·5	0·5	0·9
Spain	kg	9,285	11,054	4,065	9,551	4,224
	£'000	14·7	25·0	7·3	16·7	8·4
Madagascar	kg	–	–	50	–	–
	£'000	–	–	0·1	–	–

(a) Information not shown separately after 1964.
Source: *Bureau of the Census Report FT110,* Department of Commerce.

Table 5
Thyme oil
Imports into Japan

		1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Totals	kg	262	479	554	482	310	694	860	655	1,170	1,041
	£'000	0·4	0·9	0·9	0·8	0·6	1·4	1·6	2·1	2·7	3·2
of which from:											
France	kg	97	321	345	221	130	293	300	430	850	630
	£'000	0·1	0·6	0·6	0·3	0·2	0·5	0·5	1·4	1·7	1·5
German Fed. Rep.	kg	–	20	–	–	–	–	–	–	–	–
	£'000	–	–	–	–	–	–	–	–	–	–
Netherlands	kg	82	5	56	51	–	–	10	–	–	51
	£'000	0·1	–	0·1	0·1	–	–	–	–	–	0·5
Spain	kg	–	–	–	–	–	–	100	–	–	–
	£'000	–	–	–	–	–	–	0·3	–	–	–
United Kingdom	kg	51	106	151	210	150	301	220	175	180	260
	£'000	0·1	0·2	0·2	0·4	0·3	0·6	0·5	0·5	0·5	0·8
China	kg	–	–	–	–	–	–	175	–	–	–
	£'000	–	–	–	–	–	–	0·1	–	–	–
United States	kg	32	27	2	–	30	100	55	50	140	100
	£'000	0·1	0·1	–	–	0·1	0·3	0·2	0·2	0·5	0·4

Source: *Trade of Japan,* Japan Tariff Association.

Table 6
Thyme oil
Imports into Morocco

		1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
Totals	kg	11	–	48	–	5	37	3,081	2,675	192	176
	£'000	0·1	–	1·4	–	0·3	0·2	221·8	214·2	3·0	5·6
of which from:											
France	kg	11	–	–	–	5	37	3,081	2,675	192	176
	£'000	0·1	–	–	–	0·3	0·2	221·8	214·2	3·0	5·6
German Fed. Rep.	kg	–	–	48	–	–	–	–	–	–	–
	£'000	–	–	1·4	–	–	–	–	–	–	–

– Nil or negligible.
Source: *Statistiques Commercial et Maritime du Maroc,* Ministere de E'Economic Nationale.

Table 7
Celery oil
Quarterly Average Prices and Annual Range, London Market

		Shillings and Decimals per kilogram					
		I	II	III	IV	Annual Range Low	High
English, spot	1960	352·0	352·0	352·0	352·0	352·0	352·0
	1961	352·0	352·0	352·0	352·0	352·0	352·0
	1962	484·0	535·3	484·0	498·7	352·0	550·0
	1963	528·0	528·0	528·0	498·7	440·0	528·0
	1964	440·0	418·0	418·0	418·0	418·0	440·0
	1965	528·0	528·0	528·0	498·7	440·0	528·0
	1966	462·0	495·0	495·0	410·7	396·0	495·0
	1967	366·7	396·0	396·0	396·0	352·0	396·0
	1968	454·7	484·0	484·0	572·0	396·0	616·0
	1969	726·0	770·0	880·0	1320·0	638·0	1320·0
	1970	2455·2					
French, spot	1960	228·1	230·3	233·2	233·2	224·4	235·4
	1961	238·3	220·0	249·3	249·3	220·0	264·0
	1962	261·8	286·0	280·1	266·9	242·0	286·0
	1963	287·5	333·7	350·5	336·6	268·4	407·0
	1964	319·7	280·1	268·4	268·4	268·4	336·6
	1965	287·5	370·3	327·1	336·6	268·4	407·0
	1966	261·1	264·0	238·3	244·9	231·0	264·0
	1967	249·3	247·9	253·7	254·5	246·4	259·6
	1968	299·9	308·0	308·0	297·0	292·6	314·6
	1969	385·0	385·0	385·0	—	385·0	385·0
	1970	—					
Chinese, forward	1960	108·9	108·9	108·9	108·9	108·9	108·9
	1961	108·9	108·9	108·9	108·9	108·9	108·9
	1962	108·9	108·9	108·9	108·9	108·9	108·9
	1963	108·9	108·9	108·9	108·9	108·9	108·9
	1964	108·9	108·9	108·9	108·9	108·9	108·9
	1965	108·9	108·9	108·9	108·9	108·9	108·9
	1966	108·9	108·9	108·9	108·9	108·9	108·9
	1967	108·9	108·9	108·9	108·9	108·9	108·9
	1968	108·9	108·9	108·9	108·9	108·9	108·9
	1969	108·9	108·9	108·9	108·9	108·9	108·9
	1970	108·9					

— None available.
Source: *Perfumery & Essential Oil Record* (*Soap, Perfumery & Cosmetics* after June 1969).

Table 8
Parsley oil
Quarterly Average Prices and Annual Range, London Market

		Shillings and Decimals per kilogram					
		I	II	III	IV	Annual Range Low	High
Parsley oil, spot	1960	—	—	—	234·3	234·3	234·3
	1961	234·3	215·6	215·6	215·6	215·6	234·3
	1962	215·6	215·6	211·9	204·6	204·6	215·6
	1963	204·6	202·4	198·0	198·0	198·0	204·6
	1964	198·0	198·0	198·0	198·0	198·0	198·0
	1965	204·6	200·2	198·0	198·0	198·0	204·6
Parsley seed oil, forward	1966	256·7	286·7	308·0	308·0	242·0	308·0
	1967	308·0	308·0	308·0	308·0	308·0	308·0
	1968	308·0	308·0	308·0	308·0	308·0	308·0
	1969	308·0	308·0	308·0	308·0	308·0	308·0
	1970	308·0					
Parsley herb oil, spot	1966	*242·0	242·0	242·0	242·0	242·0	242·0
	1967	242·0	242·0	242·0	242·0	242·0	242·0
	1968	242·0	242·0	242·0	242·0	242·0	242·0
	1969	242·0	242·0	242·0	242·0	242·0	242·0
	1970	242·0					

*Per ounce.
— Not quoted.
Source: *Perfumery & Essential Oil Record* (*Soap, Perfumery & Cosmetics* after June 1969).

Table 9
Fennel seed oil
Quarterly Average Prices and Annual Range, London Market

		Shillings and Decimals per kilogram					
		I	II	III	IV	Annual Range Low	Annual Range High
Fennel, spot (Bitter fennel seed oil)	1960	24·6	29·7	29·7	29·7	22·0	29·7
	1961	29·7	29·7	29·7	29·7	29·7	29·7
	1962	29·7	29·7	29·7	29·7	29·7	29·7
	1963	29·7	29·7	29·7	29·7	29·7	29·7
	1964	29·7	29·7	29·7	29·7	29·7	29·7
	1965	33·4	35·2	35·9	31·9	29·7	37·4
	1966	33·4	55·0	41·6	37·0	28·6	55·0
	1967	37·0	30·8	31·2	34·5	30·8	37·0
	1968	33·7	38·9	40·9	36·3	33·0	41·8
	1969	36·3	36·3	36·3	36·3	36·3	36·3
	1970	36·3					
Fennel, BPC, spot (Sweet fennel seed oil)	1960	33·7	35·2	35·2	30·8	30·8	35·2
	1961	30·8	30·8	30·8	30·8	30·8	30·8
	1962	30·8	30·8	30·8	30·8	30·8	30·8
	1963	30·8	30·8	30·8	30·8	30·8	30·8
	1964	30·8	30·8	30·8	30·8	30·8	30·8
	1965	30·8	30·8	30·8	28·6	28·6	30·8
	1966	28·6	28·6	30·8	30·8	28·6	30·8
	1967	35·2	35·2	35·2	36·3	34·1	37·4
	1968	34·8	37·4	37·4	37·4	34·1	37·4
	1969	37·4	37·4	37·4	37·4	37·4	37·4
	1970	37·4					

Source: *Perfumery & Essential Oil Record* (*Soap, Perfumery & Cosmetics,* after June 1969).

Table 10
Essential oil of rosemary
Quarterly Average Prices and Annual Range, London Market

		Shillings and Decimals per kilogram					
		I	II	III	IV	Annual Range Low	Annual Range High
Spanish, spot	1960	18·3	17·4	17·6	18·0	16·5	19·8
	1961	16·9	19·8	20·4	21·3	16·5	22·0
	1962	20·5	20·7	20·9	20·9	20·4	20·9
	1963	20·7	20·2	21·5	22·9	19·3	24·2
	1964	23·5	24·8	29·2	34·7	23·1	34·7
	1965	33·0	32·8	33·4	29·7	29·7	37·4
	1966	27·9	27·9	24·0	23·5	23·0	29·7
	1967	22·4	20·5	21·5	20·9	19·8	23·1
	1968	23·1	24·2	23·7	26·0	20·9	27·5
	1969	25·3	25·3	26·4	27·1	25·3	28·6
	1970	28·6					
Tunisian, spot	1960	20·2	20·9	22·4	—	18·7	24·2
	1961	—	24·2	22·7	23·1	22·0	25·3
	1962	23·5	23·1	23·1	23·1	23·1	24·2
	1963	23·1	22·0	21·8	22·6	20·9	23·1
	1964	22·9	24·8	24·8	24·8	22·6	26·4
	1965	29·7	30·8	33·4	33·6	29·7	33·6
	1966	33·6	29·7	24·9	24·2	24·2	33·6
	1967	24·9	25·3	21·3	22·2	20·9	25·3
	1968	21·6	22·7	23·5	22·6	21·5	24·2
	1969	22·6	22·6	25·3	24·9	22·6	25·3
	1970	25·3					

— None available.
Source: *Perfumery & Essential Oil Record* (*Soap, Perfumery & Cosmetics,* after June 1969).

Table 11
Essential oil of thyme
Quarterly Average Prices and Annual Range, London Market

		Shillings and Decimals per kilogram					
		I	II	III	IV	Annual Range Low	Annual Range High
Red 45/55% Thymal, spot	1960	29·5	–	–	37·4	29·2	37·4
	1961	37·8	38·5	–	–	37·4	38·5
	1962	26·4	61·6	48·0	49·5	26·4	61·6
	1963	46·6	45·1	40·7	44·0	38·5	51·7
	1964	44·0	44·0	52·8	–	44·0	52·8
	1965	42·4	40·2	35·9	66·0	27·5	66·0
	1966	66·0	66·0	66·0	65·6	62·7	68·2
	1967	66·0	50·6	62·3	66·0	30·8	68·2
	1968	66·0	66·0	66·0	66·0	66·0	66·0
	1969	66·0	66·0	69·3	69·3	66·0	69·3
	1970	69·3				69·3	69·3
White, spot	1960	39·6-44	39·6-44	39·6-44	39·6-44	39·6	44
	1961	39·6-44	39·6-44	39·6-44	39·6-44	39·6	44
	1962	39·6-44	39·6-44	43·1	40·9	39·6	44
	1963	39·6	38·1	37·4	37·4	37·4	39·6
	1964	–	31·2	30·8	30·8	30·8	31·9
	1965	30·8	46·2	46·2	46·2	30·8	46·2
	1966	46·2	39·6	39·6	55·7	39·6	66·0
	1967	66·0	66·0	66·0	66·0	66·0	66·0
	1968	62·3	60·5	60·5	60·5	60·5	66·0
	1969	60·5	60·5	60·5	60·5	60·5	60·5
	1970	60·5				60·5	60·5

– None available.
Source: *Perfumery & Essential Oil Record* (*Soap, Perfumery & Cosmetics,* after June 1969).

Printed for Her Majesty's Stationery Office by Peridon, London NW9. D659373/1500/4/71

CFTRI, Experiment Station
Gole Bungalow, Chhindwara Road
Nagpur-1.